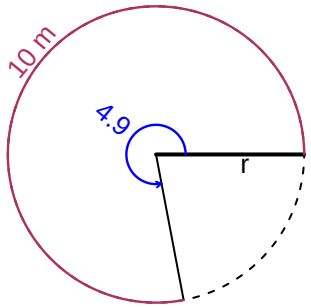
Name: Date:

Trig Final (SLTN v659)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 10 meters. The angle measure is 4.9 radians. How long is the radius in meters?

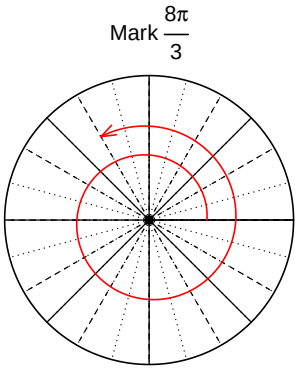


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

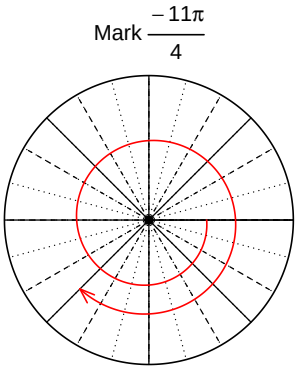
$r = 2.041$ meters.

Question 2

Consider angles $\frac{8\pi}{3}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{8\pi}{3}\right)$ and $\sin\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(8\pi/3)$



Find $\sin(-11\pi/4)$

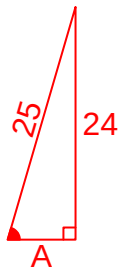
$\cos(8\pi/3) = \frac{-1}{2}$

$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{24}{25}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

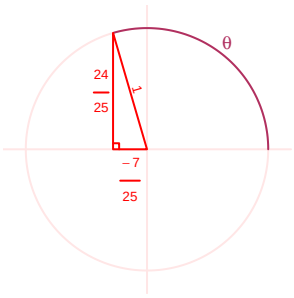
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 24^2 = 25^2$$
$$A = \sqrt{25^2 - 24^2}$$
$$A = 7$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{24}{25}}{\frac{-7}{25}} = \frac{-24}{7}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.55 meters, a midline at $y = 6.66$ meters, and a frequency of 3.47 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.55\cos(2\pi 3.47t) + 6.66$$

or

$$y = -5.55\cos(6.94\pi t) + 6.66$$

or

$$y = -5.55\cos(21.8t) + 6.66$$